CLAIMS

The embodiments of an invention in which an exclusive property or right is claimed are defined as follows:

1. A method of fabricating a laser , said method comprising the steps of:

(a) depositing a photoresist on epitaxially grown layers;

(b) patterning said photoresist to form an aperture area;

(c) depositing a dielectric material on said patterned photoresist;

(d) depositing a liftoff layer on said dielectric material;

(e) removing portions of said dielectric material and liftoff layer that border said aperture area;

(f) implanting regions of the epitaxially grown layers bordering said aperture area; and

(g) depositing a metal layer on said dielectric material.

2. The method of claim 1, wherein said epitaxially grown layers comprise a bottom semiconductor Distributed Bragg Reflector stack, an active region and a top semiconductor Distributed Bragg Reflector stack.

3. The method of claim 2, wherein said top semiconductor Distributed Bragg Reflector stack contains material chosen from the group consisting of aluminum, gallium, arsenic, indium, phosphorus and combinations thereof.

4. The method of claim 3, wherein said top semiconductor Distributed Bragg Reflector stack comprises alternating layers of pairs of aluminum gallium arsenide layers.

5. The method of claim 4, wherein said top semiconductor Distributed Bragg Reflector stack is doped.

6. The method of claim 2, wherein said top semiconductor Distributed Bragg Reflector stack has forty individual layers or less.

7. The method of claim 6, wherein said top semiconductor Distributed Bragg Reflector stack has twenty individual layers or less.

8. The method of claim 7, wherein said top semiconductor Distributed Bragg Reflector stack has eleven individual layers or less.

9. The method of claim 8, wherein said top semiconductor Distributed Bragg Reflector stack has seven individual layers or less.

10. The method of claim 1, wherein said dielectric material is chosen from the group consisting of silicon dioxide, titanium dioxide, silicon nitride, and combinations thereof.

11. The method of claim 10, wherein said dielectric material is chosen from the group consisting of silicon dioxide, titanium dioxide, and combinations thereof.

12. The method of claim 11, wherein said dielectric material is silicon dioxide.

13. The method of claim 1, wherein said device is a vertical cavity surface emitting laser.

14. A laser resulting from the method of claim 1.

15. A laser comprising:

a substrate comprising epitaxial layers and an aperture area;

a dielectric mirror formed on top of said aperture area; and

an implanted region within said substrate, said implanted region bordering said aperture area.

16. The laser of claim 15, wherein said epitaxial layers comprise a bottom semiconductor Distributed Bragg Reflector stack, an active region and a top semiconductor Distributed Bragg Reflector stack.

17. The laser of claim 16, wherein said top semiconductor Distributed Bragg Reflector stack contains material chosen from the group consisting of aluminum, gallium, arsenic, indium, phosphorus and combinations thereof.

18. The laser of claim 17, wherein said top semiconductor Distributed Bragg Reflector stack has alternating layers of pairs of aluminum gallium layers.

19. The laser of claim 16, wherein said top semiconductor Distributed Bragg Reflector stack is doped.

20. The laser of claim 16, wherein said top semiconductor Distributed Bragg Reflector stack has forty individual layers or less.

21. The laser of claim 20, wherein said top semiconductor Distributed Bragg Reflector stack has twenty individual layers or less.

22. The laser of claim 21, wherein said top semiconductor Distributed Bragg Reflector stack has eleven individual layers or less.

23. The laser of claim 22, wherein said top semiconductor Distributed Bragg Reflector stack has seven individual layers or less.

24. The laser of claim 15, wherein said dielectric mirror contains material chosen from the group consisting of silicon dioxide, titanium dioxide, silicon nitride, and combinations thereof.

25. The laser of claim 24, wherein said dielectric mirror contains material chosen from the group consisting of silicon dioxide, titanium dioxide, and combinations thereof.

26. The laser of claim 25, wherein said dielectric mirror comprises silicon dioxide.

27. The laser of claim 15, wherein said device is a vertical cavity surface emitting laser.

28. A vertical cavity surface emitting laser comprising:

a substrate;

a bottom semiconductor Distributed Bragg Reflector stack;

an active region comprising an aperture where light is emitted;

a top semiconductor Distributed Bragg Reflector stack; and

a dielectric mirror positioned on said top semiconductor Distributed Bragg Reflector stack over said aperture of said active region

wherein said semiconductor Distributed Bragg Reflector stack and said top semiconductor Distributed Bragg Relector stack comprise epitaxial layers and said bottom semiconductor Distributed Bragg Reflector stack comprises more epitaxial layers than said top semiconductor Distributed Bragg Reflector stack.

29. The vertical cavity surface emitting laser of claim 28, wherein the number of epitaxial layers comprising top semiconductor Distributed Bragg Reflector stack is less than 5% of the number of epitaxial layers comprising bottom semiconductor Distributed Bragg Reflector stack.

30. The vertical cavity surface emitting laser of claim 29, wherein said number of epitaxial layers in said top semiconductor Distributed Bragg Reflector stack is about four.

31. The vertical cavity surface emitting laser of claim 28, wherein said bottom semiconductor Distributed Bragg Reflector stack and said top semiconductor Distributed Bragg Reflector stack have certain reflectivities and said reflectivity of said bottom Distributed Bragg Reflector stack is higher than said reflectivity of said top Distributed Bragg Reflector stack.

32. A vertical cavity surface emitting laser comprising:

a substrate;

a bottom semiconductor Distributed Bragg Reflector stack;

an active region comprising an aperture area where light is emitted;

a top semiconductor Distributed Bragg Reflector stack;

an implanted region within said substrate, said implanted region bordering said aperture area; and

a dielectric mirror positioned on said top semiconductor Distributed Bragg Reflector stack over said aperture area of said active region, said dielectric mirror functioning as a guide to form said implanted region,

wherein said semiconductor Distributed Bragg Reflector stack and said top semiconductor Distributed Bragg Relector stack comprise epitaxial layers and said bottom semiconductor Distributed Bragg Reflector stack comprises more epitaxial layers than said top semiconductor Distributed Bragg Reflector stack.